# TITLE

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## METHOD FOR INFORMING MOBILE COMMUNICATION

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## TERMINAL OF ENTRANCE INTO SPECIFIC SERVICE NETWORK

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## IN MOBILE COMMUNICATION SYSTEM AND METHOD FOR

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## CHANGING INCOMING CALL INDICATION MODE TO

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## VIBRATION OR SILENT MODE

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## CLAIM OF PRIORITY

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[0001]   This application makes reference to, incorporates the same herein, and claims all benefits

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accruing under 35 U.S.C. §119 from applications for *METHOD FOR INFORMING USER*

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*WHETHER A MOBILE STATION ENTER PRIVATE MOBILE COMMUNICATION NETWORK IN*

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*PUBLIC/PRIVATE MOBILE COMMUNICATION SYSTEM* earlier filed in the Korean Intellectual

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Property Office on 10 September 2002 and there duly assigned Serial No. 2002-54637, and for

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*METHOD FOR INFORMING USER MOVEMENT TO SPECIFIC SERVICE NETWORK IN*

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*MOBILE COMMUNICATION SYSTEM AND METHOD FOR MANNER MODE CONVERSION*

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earlier filed in the Korean Intellectual Property Office on 20 March 2003 and there duly assigned

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Serial No. 2003-17609.

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## BACKGROUND OF THE INVENTION

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### Field of the Invention

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[0002]   The present invention relates to a mobile communication system, and more particularly to

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1   a method for providing a mobile communication terminal with a private mobile communication

2   service when the mobile communication terminal enters a private mobile communication network

3   in a private mobile communication system interoperable with a public mobile communication

4   network.

## Description of the Related Art

6   **[0003]**     Typically, a mobile communication network is classified into a public mobile

7   communication network and a private (or office) mobile communication network, but it is

8   impossible for the public mobile communication network to be interoperable with the private mobile

9   communication network. That is, a mobile communication system is designed and implemented to

10  enable only a public mobile communication service or only a private mobile communication service, .

11  so that a subscriber of a mobile communication terminal registered in a network can receive a

12  communication service over a specific network with which the subscriber is registered.

13  **[0004]**   Therefore, a subscriber of a mobile communication terminal registered in the public mobile

14  communication network cannot receive a private mobile communication service, and a subscriber

15  of a mobile communication terminal registered in a private mobile communication network cannot

16  receive a public mobile communication service.  As a result, it is necessary for a subscriber of a

17  mobile communication terminal to receive a public mobile communication service and a private

18  mobile communication service at the same time, using a single mobile communication terminal.  In

19  case of implementing a system for providing public and private mobile communication services at

20  the same time, it is necessary for the system to determine whether a called party's call is a call

1 generated from a public mobile communication network or a call generated from a private mobile

2 communication network in case of a call termination.

3 **[0005]** Therefore, many developers are intensively conducting research into a new communication

4 service method for enabling a subscriber of a mobile communication terminal registered in a public

5 mobile communication network to receive a private mobile communication service along with a

6 public mobile communication service. A representative example has been disclosed in Korean

7 Patent Application No. 2000-028172, filed on 24 May 2000, by the same applicant as the present

8 invention, and entitled "System for enabling Wireless Private Network Service by registering Public

9 Network Mobile Communication Terminal in Office Wireless Private Network", which is hereby

10 incorporated by reference.

11 **[0006]** However, in the case where a mobile communication terminal registered in both a public

12 mobile communication network and a private mobile communication network enters a zone of the

13 private mobile communication network while using the public mobile communication network, it

14 is difficult for a user of a mobile communication terminal to recognize the entrance into the zone of

15 the private mobile communication network before recognizing whether he or she is in a public land

16 mobile network area or in a private mobile communication network area.

17 ## SUMMARY OF THE INVENTION

18 **[0007]** Therefore, the present invention has been made in view of the above and other problems, ·

19 and it is an object of the present invention to provide a method for informing a user of a mobile

1    communication terminal of entrance into a private mobile communication network in the case where

2    the user of the mobile communication terminal moves from a public mobile communication network

3    to the private mobile communication network in a system for providing public and private mobile

4    communication services at the same time.

5    **[0008]**    It is another object of the present invention to provide a method for providing a mobile

6    communication terminal with a private mobile communication service in the case where the mobile

7    communication terminal moves from a public mobile communication network to a private mobile

8    communication network in a private mobile communication system interoperable with the public

9    mobile communication network.

10    **[0009]**    It is yet another object of the present invention to provide a method for changing an

11    incoming call indication mode to a vibration or silent mode in a private mobile communication

12    system in the case where a mobile communication terminal moves from a public mobile

13    communication network to a private mobile communication network.

14    **[0010]**    In accordance with the present invention, the above and other objects can be accomplished

15    by the provision of a method for informing a user of a private mobile communication service

16    possible area when a mobile communication terminal enters a private mobile communication

17    network being interoperable with a public mobile communication network, including the steps of:

18    a) upon receiving a system parameter message being broadcast by the private mobile communication

19    system, checking a predetermined bit for indicating the private mobile communication service area

1   contained in the system parameter message; b) if the mobile communication terminal exists in the

2   private mobile communication service area, transmitting a location registration message having a

3   predetermined registration type to the private mobile communication system; c) receiving a message

4   indicating a private mobile communication service possible state from the private mobile

5   communication system according to registration result information of the private mobile

6   communication system; and d) informing the user of the private mobile communication service

7   possible state.

## BRIEF DESCRIPTION OF THE DRAWINGS

9   [0011]   A more complete appreciation of the invention, and many of the attendant advantages

10  thereof, will be readily apparent as the same becomes better understood by reference to the following

11  detailed description when considered in conjunction with the accompanying drawings in which like

12  reference symbols indicate the same or similar components, wherein:

13  [0012]   Fig. 1 is a view illustrating a network configuration for explaining a concept of public and

14  private mobile communication services in accordance with a preferred embodiment of the present

15  invention;

16  [0013]   Fig. 2 is a view illustrating a detailed block diagram of a public/private communication

17  service unit 12 and a pBTS(8-k) of a private mobile communication system in accordance with a

18  preferred embodiment of the present invention;

19  [0014]   Fig. 3 is a flow chart illustrating a method for informing a mobile communication terminal

20  of a fact that the mobile communication terminal enters a private mobile communication network

21  from a public mobile communication network in a system for providing public and private mobile

1     communication services at the same time in accordance with a preferred embodiment of the present

2     invention;

3     **[0015]**     Fig. 4 is a view illustrating a block diagram of a mobile communication terminal in

4     accordance with a preferred embodiment of the present invention;

5     **[0016]**     Fig. 5 is a flow chart illustrating a control procedure in the case where a mobile

6     communication terminal enters a private mobile communication network in accordance with a

7     preferred embodiment of the present invention; and

8     **[0017]**     Fig. 6 shows an example of a computer including a computer-readable medium having

9     computer-executable instructions for performing the techniques of the present invention.

10     ## DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

11     **[0018]**     Now, preferred embodiments of the present invention will be described in detail with

12     reference to the annexed drawings. In the drawings, the same or similar elements are denoted by the

13     same reference numerals even though they are depicted in different drawings. In the following

14     description, a detailed description of known functions and configurations incorporated herein will

15     be omitted when it may make the subject matter of the present invention rather unclear.

16     **[0019]**     It should be noted that a private network system of a limited area such as a specific zone

17     or building provides a pre-registered mobile communication terminal with a wireless private network

18     service. In other words, the wireless private network service is transferred to only the pre-registered

19     mobile communication terminals differently from a public network service.

[0020]   Fig. 1 is a view illustrating a network configuration for explaining a concept of public and

private mobile communication services in accordance with a preferred embodiment of the present

invention. Referring to Fig. 1, a public/private (public and private) shared cell area 14 being a shared

communication service area between a public mobile communication service and a private mobile

communication service is provided to establish public and private mobile communication services

at the same time.  Also, a public/private communication service unit 12 is shown in Fig. 1.  It is

desirable that the public/private cell shared cell area 14 should provide a specific group with a

convenient communication service.  For example, provided that a specific company uses a single

building, an area containing the building can be determined as a public/private shared cell area 14.

It is desirable that the operation for determining the public/private shared cell area 14 is discussed

with a public mobile communication service provider in advance. The reason why the operation for

determining the public/private shared cell area 14 is discussed with the public mobile

communication service provider is to enable a private base station transceiver subsystem (*i.e.*, a

private BTS: 8-k) in the public/private shared cell area 14 to be recognized like a public BTS from .

the viewpoint of a public mobile communication system. In a preferred embodiment of the present

invention, the private BTS (8-k) is called a 'pBTS (private BTS)' to discriminate among a plurality

of BTSs, *i.e.*, BTSs 6-1, ...6-k, 8-1 shown in Fig. 1, and a private BTS (8-k) of the public/private

shared cell area 14. The pBTS(8-k) performs a function for constructing a wireless communication

path in association with a mobile station (MS) 24 residing in a public/private shared cell area 14 and ˙

a function for managing wireless resources in association with the mobile station (MS) 24.  The

pBTS(8-k) is connected to a BSC (Base Station Controller) of a public mobile communication

system via a public/private communication service unit 12. Namely, the pBTS(8-k) is connected to

1  a BSC(4-m) via the public/private communication service unit 12.  The public/private

2  communication service unit 12 is connected to a BSC(4-m) of a public mobile communication

3  system, a PSTN/ISDN (public switching telephone network/integrated services digital network) 16,

4  and an IP (Internet Protocol) network 18.  The public/private communication service unit 12

5  performs a mobile communication service to enable a public mobile communication service or a

6  private mobile communication service to be selectively provided to a plurality of MSs (*e.g.*, a MS

7  24) residing in the public/private shared cell area 14.  In the case where the MS 24 is registered in

8  the public/private communication service unit 12 to receive a private mobile communication service,

9  it can receive a private mobile communication service as well as a public mobile communication

10  service.  But, in the case where a private mobile communication service registration of the MS 24

11  is not recorded in the public/private communication service unit 12, the MS 24 can receive only a

12  public mobile communication service.  Also, the public/private communication service unit 12

13  performs a wired communication service with the PSTN/ISDN 16 and the IP network 18.

14  [0021]    In the meantime, the public mobile communication network is typically called a PLMN

15  (Public Land Mobile Network).  A public mobile communication system for the PLMN includes a

16  plurality of MSCs (Mobile Switching Centers) 2-1, ..., 2-n, a plurality of BSCs (Base Station

17  Controllers) 4-1, ..., 4-m, a plurality of BTSs (Base station Transceiver Subsystem) 6-1, ..., 6-k, 8-1,

18  ..., 8-k, a plurality of mobile stations MSs 20 and 22, and a HLR/VLR (Home Location

19  Register/Visitor Location Register) 10.  The plurality of BSCs 4-1, ..., 4-m are connected to each

20  of the MSCs 2-1, ..., 2-n.  The plurality of BTSs 6-1, ..., 6-k, 8-1, ..., 8-k are connected to each of

21  the BSCs 4-1, ..., 4-m.  In particular, the pBTS(8-k) functions as one of the BTSs 8-1, ..., 8-k

22  connected to the BSC(4-m) of a public mobile communication system in accordance with a preferred

1     embodiment of the present invention. Each of the MSCs 2-1, ..., 2-n enables a plurality of BSCs

2     (for example, 4-1, ..., 4-m) connected to the MSCs 2-1, ..., 2-n to be themselves connected with

3     other MSCs residing in either a PSTN/ISDN or a public mobile communication network. Each of

4     the MSCs 4-1, ..., 4-m performs a wireless link control function and a hand-off function. The BTSs

5     6-1, ..., 6-k, 8-1, ..., 8-k configure a wireless communication path together with MSs 20, 22 and 24

6     residing in their own communication service areas, *i.e.*, their own cell areas, and perform a function

7     for managing wireless resources. A HLR in the HLR/VLR 10 performs a subscriber location

8     registration function and a database function for storing subscriber information, and a VLR in the

9     HLR/VLR 10 is a database for temporarily storing information of a MS present in a cell area

10     managed by a corresponding MSC among the MSCs 2-1, ..., 2-n. If the MS moves to a cell area

11     managed by another MSC, information stored in the VLR is deleted. In the preferred embodiment

12     of the present invention, in order to discriminate between the public/private shared cell area 14 and

13     communication service areas of the BTSs (6-1, ..., 6-k, 8-1, ...) of a public mobile communication

14     system, each communication service area of the BTSs (6-1, ..., 6-k, 8-1, ...) is called a public

15     dedicated cell area. A communication service area of the BTS(8-1) among the BTSs (6-1, ..., 6-k,

16     8-1, ...) of the public mobile communication system is indicated as a public dedicated cell area 15.

17     The public dedicated cell area 15 is generally wider than the public/private shared cell area 14

18     predefined to provide a specific group with a convenient communication service.

19     **[0022]**     Fig. 2 is a view illustrating a detailed block diagram of a public/private communication

20     service unit 12 and a pBTS(8-k) of a private mobile communication system in accordance with a

21     preferred embodiment of the present invention.

**[0023]**    Referring to Fig. 2, a private mobile communication system provides a subscriber of a mobile station (MS) 40 of a limited area (*e.g.*, a zone or a building) with a wireless private network service. The private mobile communication system includes two pBTSs 8-2 and 8-k, a public/private communication service unit 12 for performing functions of a private base station controller (pBSC) and a private mobile switching center (pMSC) of a public mobile communication system, and a private home location register (pHLR) 30. The pBSC/pMSC 50 includes a BTMR (BTS Message Router) 52 and a pMSC 54. The BTMR 52 performs functions corresponding to a BSC of a public mobile communication system. Namely, the BTMR 52 performs a wireless link control function and a handoff function, *etc.* In more detail, the BTMR 52 is a module for performing a path designation of all messages to be treated in the pBTSs 8-2 and 8-k, designates a control (*i.e.*, a signal) message path for public and private call origination/termination services of a MS 40 with reference to an internal router table, and designates a message path for a maintenance service of the pBTSs 8-2 and 8-k. Also, the BTMR 52 communicates with the pHLR 30. The pMSC 54 performs a function corresponding to a role of a MSC of a prior public mobile communication network in case of supporting a public mobile communication network service and a private mobile communication network service. In more detail, the pMSC 54 analyzes a service request of a subscriber, and defines a basic strategy for determining whether the service request is treated using a prior public mobile communication network service or is treated using a private mobile communication network service, and a control procedure related to the basic strategy. The pMSC 54 cannot perform a switching function by itself differently from the public MSC. The pMSC 54 is a software block so that it has no switching unit such as a public MSC. Accordingly, in case of providing a private mobile communication service, a public/private communication service unit

1   12 according to the present invention uses a switch of a private exchange system (not shown). The

2   pHLR 30 is a module for managing subscriber information registered in a private mobile

3   communication service, location registration information of a private mobile communication

4   subscriber, and information for a variety of function services. A database for storing various kinds

5   of information is connected to the pHLR 30. The MS 40 needs to be previously registered in a

6   private mobile communication service system in order to receive a corresponding private network

7   service.

8   **[0024]**   With reference to Fig. 2, the pBSC/pMSC 50 of a private mobile communication system

9   according to the present invention informs a mobile communication terminal (MS) 40 positioned in

10   a corresponding private service area of a provision of a private mobile communication service by

11   means of a paging channel message. In more detail, the private mobile communication system

12   selects a prescribed bit from among system parameter messages (MSGs) serving as one of a variety

13   of paging channel messages, and broadcasts the selected bit. In this case, the private mobile

14   communication system is able to set a reserved bit being unused in the system parameter message

15   in order to indicate that the MS 40 exists in a specific network area. Namely, the private mobile

16   communication system indicates a private network area using empty bits of the system parameter

17   message, and broadcasts the system parameter message. In this case, the empty bits of the system

18   parameter message are not defined in communication standards.

19   **[0025]**   A detailed format of the system parameter message is shown in the following Table 1.

[0026]   [Table 1]

| System Parameter Message : IS-2000 (F-CSCH) |
|---|
| pilot_pn : 356 |
| config_msg_seq : 7 |
| sid : 2189 |
| nid : 65 |
| reg_zone :1 |
| total_zones : 3 |
| zone timer 0 -> 1 minute |
| mult_sids : 1 |
| mult_nids : 1 |
| **base_id : 449** |
| base_class 0 |
| # of paging chan : 1 |
| max_slot_cycle_index : 1 |
| home_reg : 1 |
| for_sid_reg : 1 |
| for_nid_reg :1 |
| power_up_reg :1 |
| power_down_reg : 1 |
| parameter_reg : 1 |
| reg_prd : 68 |
| base_lat : 536505 |
| base_long: 1829561 |

| | |
|---|---|
| 1 | reg_dist : 0 |
| 2 | srch_win_a : 7 |
| 3 | srch_win_n : 8 |
| 4 | srch_win_r : 0 |
| 5 | nghbr_max_age : 1 |
| 6 | pwr_rep_thresh : 2 |
| 7 | pwr_rep_frames : 7 |
| 8 | pwr_thresh_enable : 1 |
| 9 | pwr_period_enable : 0 |
| 10 | pwr_rep_delay : 5 |
| 11 | rescan : 0 |
| 12 | t_add : 26 |
| 13 | t_drop: 30 |
| 14 | t_comp: 3 |
| 15 | t_tdrop: 4 |
| 16 | ext_sys_parameter : 1 |
| 17 | ext_nghbr_list : 1 |
| 18 | gen_nghbr_list : 0 |
| 19 | global_redirect : 0 |
| 20 | pri_nghbr_list : 0 |
| 21 | user_zone_id : 0 |
| 22 | ext_global_redirect : 0 |
| 23 | ext_chan_list : 0 |

1  [0027]  With reference to the above Table 1, the private mobile communication system sets a third

2  bit value of a parameter "base_id" contained in the aforementioned system parameter messages to

3  "1", and broadcasts this system parameter message. If the MS 40 enters a private network service

4  possible area, then it receives the system parameter message being broadcast in a mobile

5  communication system. The MS 40 searches for a settable bit used for indicating its own presence

6  in a specific network from among the received system parameter messages, such that it is determined

7  that the MS 40 exists in a private network when the settable bit is found.


8  [0028]  As described above, the system parameter messages contain such a settable bit used for

9  indicating the presence of the MS 40 in a specific network service possible area. It will be apparent

10  to those skilled in the art that this settable bit is not limited to only the third bit of the parameter

11  "base_id" and will be set to any empty bit contained in the system parameter messages.


12  [0029]  On the other hand, if the MS 40 exists in the private network service possible area, then

13  it transmits a registration message to the pBTS1 8-2 and the pBTS2 8-k of a wireless private network

14  over an access channel. In more detail, the MS 40 indicates a current registration type in a field

15  "location registration type" contained in the registration message, and transmits the field "location

16  registration type" having the current registration type to the pBTS1 8-2 and the pBTS2 8-k. The

17  following Table 2 designates this field "location registration type" of the registration message

18  according to the present invention.


19  [0030]  [Table 2]

| | Registration Type | Element identifier |
|---|---|---|
| 1 | | |
| 2 | LR_TIME_BASE | 0 |
| 3 | LR_POWER_ON | 1 |
| 4 | LR_ZONE_BASE | 2 |
| 5 | LR_POWER_OFF | 3 |
| 6 | LR_PARA_CHANCE | 4 |
| 7 | LR_DISTANCE | 6 |
| 8 | **LR_N_ZONE** | **13** |

9    **[0031]**    The registration message includes six registration types according to the 3G-IOS (3-

10    Generation Inter-Operability Specification). The registration message has a registration type called

11    "N_ZONE" according to the present invention. The registration type "N_ZONE" indicates that the

12    MS 40 exists in a private mobile communication network and needs to be registered therein.

13    **[0032]**    In more detail, if the MS 40 receives a system parameter message from the private mobile

14    communication system, then it can recognize its own presence in the private mobile communication

15    network. If the MS 40 recognizes its own entrance into the private mobile communication network,

16    then it transmits a registration message having the registration type "N_ZONE" to the private mobile

17    communication system. In more detail, if the MS 40 exists in a private mobile communication

18    service area, then it transmits a registration message having the registration type "N_ZONE" to the

19    private mobile communication system in order to request a private mobile communication service

20    of the private mobile communication system. The registration type "N_ZONE" employs an element

1 identifier unused by a registration type proposed by the communication standards. It will be apparent

2 to those skilled in the art that this element identifier can be freely set in all the applicable

3 communication networks of the present invention.

4 **[0033]** In the meantime, if the MS 40 receives a system parameter message from a private mobile

5 communication system, then it searches for a settable bit used for indicating its own presence in a

6 specific network from among the received system parameter messages, such that it is determined that

7 the MS 40 exists in a private network when the bit is found. Therefore, the MS 40 stores a

8 prescribed program having a control flow in order to transmit a registration message having the

9 registration type "N_ZONE". It will be apparent to those skilled in the art that the prescribed

10 program having such a control flow can be readily and through software implemented in the MS 40.

11 **[0034]** Referring again to Fig. 2, if the pBSC/pMSC 50 of the private mobile communication

12 system receives the registration message from the MS 40, then it determines whether the MS 40 can

13 receive a private network service. Namely, the private mobile communication system determines

14 whether the MS 40 transmitting the registration message is previously registered in its own system.

15 In brief, in order to allow the MS 40 to receive a prescribed private network service, the MS 40

16 should be previously registered in a private mobile communication system for the prescribed private

17 network service.

18 **[0035]** Provided that the MS 40 is registered in such a private mobile communication system, the

19 private mobile communication system can provide the MS 40 with a command or information

1    indicative of a service possible or impossible state via a paging channel message. In accordance with

2    the present invention, the private mobile communication system sets up a prescribed field of a FNM

3    (Feature Notification Message) shown in the following Table 3 in order to indicate a private network

4    service possible state of a corresponding MS.


5    **[0036]**    [Table 3]


| Information Element | Element Direction | Type | |
|---|---|---|---|
| Message Type | MSC➔BS | M | |
| Mobile Identity (TMSI/ | MSC➔BS | $M^a$ | |
| Tag | MSC➔BS | O | C |
| Cell Identifier List | MSC➔BS | $O^b$ | C |
| Slot Cycle Index | MSC➔BS | $O^c$ | C |
| Signal | MSC➔BS | $O^d$ | C |
| Message Waiting Indication | MSC➔BS | $O^{e,d}$ | C |
| Calling Party ASCII Number | MSC➔BS | $O^d$ | C |
| IS-95 Information Records | MSC➔BS | $O^f$ | C |


16    **[0037]**    The FNM is a message for allowing a mobile communication system to provide the MS

17    40 with authentication and authentication service information. The private mobile communication

18    system indicates that the MS 40 exists in a wireless private network service possible area using a

19    field "CHARi" of the IS-95 (Telecommunications Industry Association/Electronic Industries

1  Association (TIA/EIA) Interim Standard (IS) 95 series) Information Records Element of the FNM.

2  Therefore, the MS 40 can inform a user of the presence of his or her MS in the wireless private

3  network service possible area.  The following Table 4 designates the IS-95 Information Records

4  Element field of the FNM.

5  **[0038]**   [Table 4]

| IS-95 Information Records | |
|---|---|
| IS_95 Information Records : AI Element Identifier | 0x15 |
| IS_95 Information Records Length | 0x03 |
| Information Record Type | 0x01 |
| Information Record Length | 0x01 |
| **Information Record Contents (CHARi)** | **0xFF** |

12  **[0039]**   With reference to the above Table 5, the private mobile communication system sets the

13  CHARi field of the IS-95 Information Records Elements of the FNM to "0xFF", and transmits the

14  CHARi field with the "0xFF" to the MS 40.  The CHARi field is a reserved field defined in

15  communication standards in order to transmit prescribed information from the pBSC/pMSC 50 to

16  the MS 40.  The private mobile communication system informs the MS 40 of a wireless private

17  network service possible state using the reserved field.

[0040] Therefore, in the case where the MS 40 checks the Information Record Contents (CHARi) field of the received FNM and determines that the CHARi field is set to "0xFF", it is determined that the MS 40 exists in a wireless private network service possible area and this determination message is then transmitted to a user of the MS 40. This method for allowing the MS 40 to inform a user of a wireless private network service possible area can be freely set to one of a variety of indication methods, for example, an icon display, a voice message, and a character display.

[0041] In the meantime, a private mobile communication system according to another preferred embodiment of the present invention provides a predetermined field of the FNM with a vibration mode conversion command, such that the MS automatically changes its own incoming call indication mode to the vibration mode when the mobile communication terminal enters a private mobile communication network area. Also, the private mobile communication system enables the MS to receive a private dedicated wireless service through a predetermined field of the FNM.

[0042] In more detail, as described above, the pBSC /pMSC 50 sets a specific bit in the system parameter message being broadcast to the private mobile communication network area 70. The MS 40 receiving a system parameter message recognizes its own presence in the range of a private network service area, and then transmits a registration message to the private mobile communication system. Then, the private network mobile communication system transmits an authentication confirmation message and its associated service information to the MS 40. In this case, a vibration or silent mode conversion command is added to the message transmitted to the MS 40. This vibration or silent mode conversion command (hereinafter referred to as a manner mode conversion

1    command) can be set to a predefined value contained in the IS-95 Information Records field of the

2    FNM.

3    **[0043]**   Therefore, upon receiving the manner mode conversion command from the private mobile

4    communication system, the MS 40 converts an incoming call indication mode into a manner mode

5    such as a vibration or silent mode. In this case, if a predefined value is set up in the IS-95

6    Information Records field of the FNM, then the MS 40 automatically converts the incoming call

7    indication mode into the manner mode.

8    **[0044]**   In this case, it will be apparent to those skilled in the art that the MS 40 stores a prescribed

9    program for searching for a settable bit from among the FNM received from the private mobile

10    communication system in order to convert the incoming call indication mode into the manner mode

11    such as a vibration or silent mode, and converting the incoming call indication mode into the manner

12    mode according to this bit search result.

13    **[0045]**   On the other hand, although the FNM is adapted to indicate a wireless private network

14    service possible area, predetermined information or function using the Information Record Contents

15    (CHARi) field of the IS-95 Information Records Element, the present invention is not limited to only

16    this description, but any other field of the FNM can be freely defined or used according to a

17    communication network applied to the present invention.

18    **[0046]**   Fig. 3 is a flow chart illustrating a method for informing a mobile communication terminal

19    of a fact that the mobile communication terminal enters a private mobile communication network

1   from a public mobile communication network in a system for providing public and private mobile

2   communication services at the same time in accordance with a preferred embodiment of the present

3   invention.

4   **[0047]**   Referring to Figs. 2 and 3, a pBSC/pMSC 50 of a private mobile communication system

5   sets a specific bit in a system parameter message being one of paging channel messages, and

6   broadcasts the specific bit at step 102. That is, a private mobile communication system sets a

7   reserved bit unused in the system parameter message, and broadcasts the reserved bit to a private

8   network. If the mobile communication terminal (MS) 40 receives a system parameter message, then

9   it searches a bit for indicating an entrance into a private network in the system parameter message.

10  In this case, if a corresponding bit is set up, then it is determined that service zones of the pBTS1 8-2

11  and the pBTS2 8-k of a private mobile communication network are provided at step 104.

12  Subsequently, the mobile communication terminal (MS) 40 transmits a location registration message

13  to the pBTSs 8-2 and 8-k at step 106. A current location registration type is indicated in a field

14  Regi_type among a plurality of fields predefined in a prior location registration message. In

15  accordance with the present invention, a mobile communication terminal (MS) 40 adds a newly

16  defined location registration type to the prior location registration message, and transmits the added

17  message to the pBTSs.

18  **[0048]**   Herein, the reason why the MS 40 uploads terminal information using an access channel

19  is to perform a subscriber authentication in case of a plurality of private mobile communication

20  network areas. For instance, in the case where a private wireless network service is provided in

1   different areas, a subscriber of a first area A cannot receive a private wireless network service in a

2   second area B.

3   [0049]   If the pBSC/pMSC 50 of a private mobile communication system receives a location

4   registration request message from the MS 40, then it requests information of a corresponding

5   subscriber from the pHLR 30 at step 108. The pHLR 30 searches a subscriber database, and

6   transmits the searched result to the pBSC/pMSC 50 at step 110. The pBSC/PMSC 50 determines

7   whether the corresponding subscriber is a subscriber registered in a private mobile communication

8   network at step 112. If it is determined at step 112 that the corresponding subscriber is the

9   subscriber registered in the private mobile communication network, the pBSC/pMSC 50 sets a

10  predetermined field of a FNM (Feature Notification Message) and transmits the predetermined field

11  to the MS 40 at step 114. If it is determined at step 112 that a corresponding subscriber is not a

12  subscriber registered in a private mobile communication network, the pBSC/pMSC 50 provides a

13  general public wireless network service at step 120. In the meantime, the MS 40 receiving the FNM

14  searches for a predetermined field within the FNM. If it is determined that a corresponding private

15  mobile communication network service is possible, this private mobile communication network

16  service possible state is informed a user of the MS 40 at step 116. In this case, this method for

17  informing the user of the private mobile communication network service possible state can be freely

18  set to one of a variety of indication methods, for example, an icon display, a voice message, and a

19  character display, *etc.*

[0050] In more detail, the private mobile communication system informs the MS of a private wireless network service possible area using a predetermined field of the FNM, the MS can inform the user of his or her presence in the range of the wireless private network service possible area using a variety of indication methods, for example, an icon display, a voice message, and a character display, *etc.*

[0051] In accordance with another preferred embodiment of the present invention, other information or other function may be defined and used using a predetermined field of the FNM. A private mobile communication system according to the present invention can easily provide an authenticated MS with various services provided from the wireless private network. For example, the private mobile communication system provides a predetermined field of the FNM with a vibration mode conversion command such that a current mode of the MS is automatically changed to a vibration mode when the MS enters the private mobile communication network. In addition, the private mobile communication system may allow the MS to access the private dedicated wireless network through a predetermined field of the FNM.

[0052] Fig. 4 is a view illustrating a block diagram of a mobile communication terminal in accordance with a preferred embodiment of the present invention.

[0053] Referring to Fig. 4, a controller 340 controls an overall operation of the MS. Upon receiving a system parameter message being broadcast from the private mobile communication system, the controller 340 transmits a location registration message for the wireless private network service to the private mobile communication system. Upon receiving the FNM from the private

1    mobile communication system, the controller 340 searches for a predetermined field from among

2    the FNM in order to determine whether the MS exists in a wireless private network service possible

3    area. If the controller 340 of the MS determines that the MS exists in a wireless private network

4    service possible area, this determination result is transferred to a user of the MS. The user of the MS

5    40 can freely select his or her desired one from among various indication methods (*e.g.*, an icon

6    display, a voice message, and a character display, *etc.*) for indicating a wireless private network

7    service possible area. The controller 340 of the MS 40 informs the user of a wireless private network

8    service possible area according to prescribed methods.

9    **[0054]**    In accordance with another preferred embodiment of the present invention, upon receiving

10   the FNM from the private mobile communication system, the controller 340 of the MS searches for

11   all settable bits to perform a predetermined command in the FNM, and performs operations related

12   to each bit setup value.

13   **[0055]**    A RF (radio frequency) unit 300 controls a transmission/reception operation of audio data,

14   character data, and control data upon receiving a control signal from the control unit 340. An

15   interface unit 320 includes a plurality of number keys and function keys, and outputs key input data

16   corresponding to any key selected by a user to the controller 340. Each number key and function key

17   is implemented with a soft key. A display 360 displays a variety of messages on for example an

18   LCD (Liquid Crystal Display) according to a control signal of the controller 340. The display 360

19   informs a user of a wireless private network service possible area upon receiving a control signal

1     from the controller 340. Herein, information message transmitted to the user can be displayed in the

2     form of an icon or character for example.

3     **[0056]**    A memory 380 includes a program memory for storing program data needed to control an

4     operation of the MS and a data memory for storing data created by either a user or control process

5     of the MS. In the meantime, the MS 40 may audibly inform the user of a wireless private network

6     service possible area using a voice processor or a speaker.

7     **[0057]**    On the other hand, in accordance with another preferred embodiment of the present

8     invention, the MS may further contain a vibrator. Therefore, if the MS enters a wireless private

9     network service area, an incoming call indication mode of the MS is switched to a vibration mode

10    upon receiving a message from a private mobile communication system.

11    **[0058]**    Fig. 5 is a flow chart illustrating a control procedure in the case where a mobile

12    communication terminal enters a private mobile communication network in accordance with a

13    preferred embodiment of the present invention.

14    **[0059]**    Referring to Figs. 2 and 5, if the MS 40 enters a private mobile communication network,

15    then it receives a system parameter message being broadcast by a private mobile communication

16    system at step 202. The MS 40 determines its presence in a private wireless network service area

17    using the system parameter message at step 204. Subsequently, the MS 40 transmits a location

1    registration message for a private wireless network service to the private mobile communication

2    system at step 206.

3    **[0060]**    A private mobile communication system determines if a corresponding subscriber is

4    registered in a private wireless network using a location registration message transmitted from a

5    mobile communication terminal, and transmits a FNM on the basis of the determined result. Then,

6    it is determined at step S208 whether the MS 40 receives the FNM. If the MS 40 receives the FNM,

7    then it informs a user of a fact that a current position is in a private wireless network service area at

8    step 210. In this case, the MS 40 can inform the user of this fact using a variety of indication

9    methods, for example, an icon display, a voice message, a character display, vibration, a ring tone,

10    *etc.*

11    **[0061]**    If the MS 40 is outside of the private mobile communication network area 70, then it

12    receives a system parameter message from a public network mobile communication system. Because

13    the system parameter message is generated from a public network mobile communication system,

14    a specific bit for indicating a wireless private network service area is not set up. Therefore, if the

15    MS 40 receives a system parameter message from the public network mobile communication system,

16    then it can recognize its presence in a private network service area.

17    **[0062]**    The present invention can be implemented as computer-executable instructions in

18    computer-readable media. The computer-readable media includes all possible kinds of media in

19    which computer-readable data is stored or included or can include any type of data that can be read

1      by a computer or a processing unit. The computer-readable media include for example and not

2      limited to storing media, such as magnetic storing media (*e.g.*, ROMs, floppy disks, hard disk, and

3      the like), optical reading media (*e.g.*, CD-ROMs (compact disc-read-only memory), DVDs (digital

4      versatile discs), re-writable versions of the optical discs, and the like), hybrid magnetic optical disks,

5      organic disks, system memory (read-only memory, random access memory), non-volatile memory

6      such as flash memory or any other volatile or non-volatile memory, other semiconductor media,

7      electronic media, electromagnetic media, infrared, and other communication media such as carrier

8      waves (*e.g.*, transmission via the Internet or another computer). Communication media generally

9      embodies computer-readable instructions, data structures, program modules or other data in a

10      modulated signal such as the carrier waves or other transportable mechanism including any

11      information delivery media. Computer-readable media such as communication media may include

12      wireless media such as radio frequency, infrared microwaves, and wired media such as a wired

13      network. Also, the computer-readable media can store and execute computer-readable codes that

14      are distributed in computers connected via a network. The computer readable medium also includes

15      cooperating or interconnected computer readable media that are in the processing system or are

16      distributed among multiple processing systems that may be local or remote to the processing system.

17      The present invention can include the computer-readable medium having stored thereon a data

18      structure including a plurality of fields containing data representing the techniques of the present

19      invention.

20      [0063] An example of a computer, but not limited to this example of the computer, that can read

21      computer readable media that includes computer-executable instructions of the present invention is

1   shown in FIG. 6. The computer 600 includes a processor (central processing unit) 602 that controls

2   the computer 600. The processor 602 uses the system memory 604 and a computer readable memory

3   device 606 that includes certain computer readable recording media. A system bus connects the

4   processor 602 to a network interface 608, modem 612 or other interface that accommodates a

5   connection to another computer or network such as the Internet. The system bus may also include

6   an input and output interface 610 that accommodates connection to a variety of other devices.

7   **[0064]** In conclusion, according to the present invention, a MS informs a user of its entrance into

8   a specific area of a mobile communication system, such that a user can easily adapt a wireless private

9   network service.

10   **[0065]**   As apparent from the above description, the present invention enables a mobile

11   communication terminal (MS) to accurately recognize a time at which the MS enters a private

12   wireless network, thereby allowing a user of the MS to easily employ a specific service such as a

13   private wireless Internet service, *etc.*

14   **[0066]**   In accordance with another preferred embodiment of the present invention, the present

15   invention provides a method for changing an incoming call indication mode to a manner mode such

16   as a vibration or silent mode in a private mobile communication system in the case where the MS

17   moves from a public mobile communication network to a private mobile communication network.

1     **[0067]**   Although the present invention discloses a specific case where the MS moves from a public

2     mobile communication network to a private network limited by a specific area or building, it can also

3     be applicable to another case where the MS enters a specific area used for providing a service being

4     different from a public network service in the public mobile communication network.

5     **[0068]**   Although the preferred embodiments of the present invention have been disclosed for

6     illustrative purposes, those skilled in the art will appreciate that various modifications, additions and

7     substitutions are possible, without departing from the scope and spirit of the invention as disclosed

8     in the accompanying claims.